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INTRODUCTION



WAR OUTSIDE THE RULES

In times of peace, individuals and states follow higher standards. . . . But war is a stern teacher.

—THUCYDIDES, *HISTORY OF THE PELOPONNESIAN WAR*

A PHALANX OF WARRIORS armed with swords and spears advances across an open plain to confront a force of similarly armed men. Following the rules of fair combat, the fighting is hand-to-hand and grimly predictable. After the battle, the dead are retrieved, and victory is clear and honorable.

This stark picture has been widely assumed to sum up the ancient experience of armed conflict. Images of a long-lost era of heroic combat by brave men wielding simple weapons continue to inspire us: the Trojan War of Homeric myth, the historic Battle of Marathon, the Spartans facing the Persians at Thermopylae, the outnumbered Athenian triremes defeating the Persian fleet at Salamis, the Romans resisting Hannibal. But behind these glorious vignettes lurks a darker military reality, and terrifying options that rendered the courage of warriors meaningless. This book chronicles how the genie of biochemical warfare first escaped.

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Germ warfare? Chemical weapons? Most people assume these terrors are recent innovations. Surely the ability to turn pathogens, toxins, and chemicals into tools of war requires modern scientific understanding of epidemiology, biology, and chemistry, as well as advanced delivery systems. Besides, wasn't warfare in antiquity based on honor, valor, and skill? Outside of a few well poisonings, the odd plague victim catapulted over walls in the Middle Ages, and the fabled Byzantine recipe for Greek Fire, no one really waged deliberate biological or chemical warfare until the modern era. Or did they?

Ways of turning nature's armory into weapons of war were actually practiced—and documented—much earlier and more often in premodern eras than has been commonly realized. In their “History of Biological Warfare,” for example, the microbiologists James Poupard and Linda Miller acknowledged that early civilizations used some crude forms of biological warfare, but they alluded to only two vague examples before the eighteenth century. “Historical documentation [of] the use of biological warfare has always been sparse,” they wrote. “The murkiness of the historical record may discourage academic pursuit of the subject but does add a certain mystique to attempts to chronicle the history of biological warfare.”¹

Why has the ancient world remained uncharted territory in the history of chemical and biological warfare?

In the first place, many historians have assumed that biochemical weaponry required scientific knowledge not yet developed in antiquity. Second is the assumption that even if cultures of the past *knew* how to make war with toxins and combustibles, they generally refrained from such strategies out of respect for traditional rules of war. The third reason is the difficulty of systematically collecting widely scattered and

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little-known ancient accounts of biochemical weapons and their forerunners in the ancient world.

That evidence is gathered and analyzed for the first time in this book, and it far exceeds what we have been led to expect for prescientific societies. The evidence also reveals that despite some ancient literature expressing deep-seated aversion to the use of poison in war, toxic weapons were deployed by many ancient peoples. The sheer number of legendary narratives and historically verifiable incidents compels us to revise assumptions about the origins of biological and chemical warfare and its moral and technological constraints.

The ideas of poison and incendiary weapons were first described in ancient mythology, in stories about arrows dipped in serpent venom and toxic plants, water poisoned with drugs, and other tactics. The legendary Trojan War was won with poison arrows, and celebrated heroes of Greek myth—Heracles, Odysseus, and Achilles—deliberately treated their weapons with toxins.

But killing enemies by exploiting the lethal forces of nature was not just mythical fantasy. I've gathered accounts from more than fifty authors in the ancient world, along with modern archaeological finds, to provide evidence that biological and chemical weapons saw action in historical battles—in Europe and the Mediterranean, North Africa, Mesopotamia, Anatolia, the Asian steppes, India, and China. Among the historical victims and perpetrators of biochemical warfare were such prominent figures as Hannibal, Julius Caesar, and Alexander the Great.

This book is not exhaustive, but aims to reveal the depth and sweep of the evidence for biological and chemical warfare in antiquity. The time frame ranges over almost three

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thousand years, beginning with Near Eastern records of 1500 BC and archaic Greek myths first put in writing by Homer in about 750–650 BC. From the fifth century BC through the second century AD, Greek historians documented many examples of warfare waged by biological and chemical means, as did numerous Latin accounts, beginning with the foundation of Rome and continuing through the late Roman Empire of the sixth century AD. Meanwhile, in China and India, weapons of poison and combustible chemicals were described in military and medical treatises from about 500 BC onward. The story continues with the development of Greek Fire and other incendiaries described in Byzantine and Islamic sources of late antiquity, from the seventh through thirteenth centuries AD.

In each chapter, I present modern scientific discoveries and technological developments that help illuminate the ancient accounts and show how early unconventional weapons and strategies have evolved into many of today's biological and chemical armaments.

The range of human inventiveness in the early annals of biochemical warfare is staggering. But equally impressive is the way the ancient examples foreshadow, in substance or in principle, so many basic forms of biological and chemical weapons known today, even the most scientifically advanced armaments.

Pathogens and toxins unleashed on enemies? Since the invention of the atlatl and the bow, archers have created toxic projectiles with snake venoms, poison plants, and bacteriological substances. Other biological options included contaminating an enemy's water and food supplies, or forcing foes to camp in mosquito-infested marshes.

Anthrax, smallpox, plague, and other diseases as weapons? Deliberate attempts to spread contagion are recorded in cune-

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iform tablets and biblical traditions, and by Roman historians who decried “man-made pestilence.” Vaccinations to protect against bioweapons? The ancients were the first to try to seek immunity against the toxic weapons of their day.

Today it is feared that a single “smallpox martyr” or other deliberately dispatched carriers of contagion could deliver a devastating biological attack. The practice of sending infected individuals into enemy territory was already operating more than three thousand years ago among the Hittites. Later, there were rumors of “Poison Maidens” sent to assassinate Alexander the Great and other military commanders.

What could be more modern than “ethnic” bioweapons? These agents, based on genetic engineering of DNA, would target certain racial groups. Yet the primitive intent of such weapons lies in the systematic slaughter of men and the rape of women, crude but effective blows against an enemy’s reproduction. Practiced since earliest times, such strategies were documented in the breakup of former Yugoslavia in the early 1990s and other ethnic wars, most recently carried out in 2014–15 by the terrorist group IS/ISIL/ISIS (Islamic State of Iraq and the Levant/Islamic State of Iraq and Syria) and by Hindu fundamentalists against Muslims in India in 2019–20. And now, genetically engineered pathogens are emerging as a new and urgent biosecurity threat.²

Modern “wars on terrorism” have launched so-called nonlethal weapons, such as “calmative mists,” to tranquilize, disorient, or knock out enemies, rendering them incapable of defending themselves. An early application of this principle, dating to about 1000 BC, was an ingenious drug plot by devised by Chrysamé to help the king of Athens conquer Ionia (western Turkey).³ Victories via intoxicants occurred

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in ancient military engagements in Gaul, North Africa, Asia Minor, and Mesopotamia. The biological “calmatives” of antiquity included toxic honey, drugged sacrificial bulls, barrels of alcohol, and mandrake-laced wine.⁴

What about stench warfare? Or acoustic weapons, such as the sonic attacks on US embassies beginning in 2016? These also have forerunners in ancient warfare. In recent years military scientists in the United States, Israel, China, and Russia have unveiled so-called psychologically toxic armaments designed by bioengineers to assault the senses with unbearable odors and intolerable sound waves, which can also inflict serious and lasting neurological damage. More than two millennia ago, armies in Asia and Europe employed noxious smells and blaring noises to disorient and overwhelm foes. (For ancient and modern stench and acoustic weapons, see chapter 6; microwave weapons, chapter 7.)

Rats wired to deliver explosives? Sea lions as sentinels or assassins? Bees enlisted to detect the presence of enemies and chemical agents? Even these modern biological operations have ancient antecedents. Live insects and animals have been drafted for war for thousands of years: wasps’ nests were lobbed over walls, vipers were catapulted onto ships, and scorpion grenades were hurled at besiegers. A veritable menagerie of creatures—from mice and elephants to flaming pigs—became involuntary allies on the battlefields of antiquity. Generals even devised ways for animals to deliver combustibles and figured out how to exploit interspecies hostilities (chapter 6).

How about poison gas, flamethrowers, incendiary bombs? Propelling fire and creating toxic fumes have a venerable history too (chapters 3 and 7). Flaming arrows were only the

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beginning. The Assyrians tossed firebombs of oil, and during the Peloponnesian War, the Spartans created poison gas and flame-blowing machines to defeat fortified positions. Recipes for toxic smoke were secret weapons in ancient China and India, and asphyxiating gases suffocated many a tunneler in Roman-era sieges. Meanwhile, catapults shot firebolts fueled by sulfur. In the time of Alexander the Great, fireships laden with burning chemicals destroyed navies, and foot soldiers were incinerated by incendiary shrapnel in the form of red-hot sand. During the siege of Syracuse in 212 BC, mirrors were used to ignite ships, more than two thousand years before the development of high-tech laser and microwave guns.

Napalm? Invented in the 1940s, this petroleum weapon that flows like water and adheres like flaming honey wreaked devastation in Vietnam in the 1970s. So-called Greek Fire had similar properties and became the dreaded naval incendiary of the Byzantine era, until the formula was lost forever. But many centuries earlier, long *before* the invention of Greek Fire in AD 668, petroleum and other chemicals were combined to create harrowing weapons of unquenchable fire, used to immolate Roman soldiers in the Middle East.



What all these modern weapons and their ancient precursors have in common is the fact that they allow their creators to *weaponize nature*, according to the best understandings of the day. Not all of the ancient examples presented in the following chapters fit the strict definitions of biological or chemical weapons current today, of course, but they do represent the earliest evidence of the *intentions, principles, and practices* that

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evolved into modern biological and chemical warfare. The parallels between the prescientific methods of antiquity and the most up-to-the-minute armaments suggest the need to expand the definitions of biological and chemical weaponry beyond narrow categories.

Chemical warfare is defined as the military use of poisonous gases and incendiary materials, and includes blistering, blinding, and asphyxiating agents and mineral-based poisons. *Biological* weapons are viable, based on living organisms. The organisms include infectious bacteria, viruses, parasites, and spores, all of which can multiply in the body to intensify in effect, and can be contagious. The hostile use of plant toxins and venomous substances derived from animals, including reptiles, amphibians, marine creatures, and insects, constitutes another category of biological weapons. Living insects and animals turned to the service of war, and genetic strategies against adversaries, are additional types of weapons based on biology. The natural weapons arsenal also comprises disabling or harmful agents created through biology, chemistry, and physics to act on the body. These include pharmaceuticals, malodorants, light or sonic waves, microwaves, electric shocks, heat rays, and the like. Using scientific knowledge to create agents that give soldiers special powers or protection can also be considered part of the biochemical armory.⁵

In essence, biochemical warfare is the manipulation of the forces or elements of nature to insidiously attack or destroy an adversary's biological functions in ways that cannot be deflected or avoided. Biological agents and chemical incendiaries are "force multipliers"; they intensify levels of suffering and the scale of destruction of human life far beyond what would be expected in conventional warfare. In early antiquity,

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conventional weapons were sharp or blunt instruments of stone, wood, and metal: rocks, arrows, spears, swords. Over time, catapults and other siege machines came to be generally accepted as conventional, but poison weapons, despite their recurrent use, continued to arouse ethical concern and condemnation.⁶

Historical texts document specific episodes of biological and chemical warfare in datable conflicts, but myths and legendary events, ideas for creating biochemical weaponry, and recipes of evil effect also demonstrate the antiquity of the quest for ever more ingenious ways of turning nature to military use. The conscious *intentions* to communicate infectious disease, regardless of success, are valid criteria for analyzing biological warfare, according to the microbiologist and bio-war historian Mark Wheelis. For example, the ancient practice of entreating the gods who were believed to control plagues to attack enemies demonstrates a clear *desire* to wage biological warfare. Accusations of the deliberate spread of epidemics also belong in this history, because, as Wheelis has noted, they “attest to the fact that biological attack” was imaginable and plausible.⁷



After citing a few oft-repeated incidents of biochemical strategies in antiquity and the Middle Ages, typical histories of biological and chemical weaponry usually designate the gas warfare of World War I as the beginning point. Historians have assumed that biological and chemical weapons were exceedingly rare in antiquity because they were inhibited by societal or religious constraint and expressly forbidden in codes of war

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valuing reciprocal risk and honorable combat. Indeed, the existence of age-old “taboos” against the use of poisons in war, many historians argue, can serve as the moral backbone for creating sustainable, effective biochemical arms treaties today.

But as it turns out, war with poison and chemicals was not so rare in the ancient world and reactions to it were complex. An astounding panoply of toxic substances, venomous creatures, poison plants, animal and insect vectors, deleterious environments, virulent pathogens, infectious agents, noxious gases, and combustible chemicals were marshaled to defeat foes—and *panoply* is an apt term here, because it is the ancient Greek word for “all weapons.” Many of these bioweapons and stratagems, some crude and others quite sophisticated, were considered fair, acceptable tactics of war, while others were reviled.

The ancient tension between notions of fair combat and actual practice reveals that moral questions about biochemical weapons are not a modern phenomenon, but have troubled humanity ever since the first war arrow was dipped in poison. Ethical revulsion for poison weapons did not arise in a vacuum but developed in reaction to real practices. Edward Neufeld, a scholar of ancient Mesopotamia, has suggested that the “deep aversion to this type of warfare” did not stem from humanitarian philosophies, but was a moral judgment that flowed directly from “feelings evoked by experience” with egregiously cruel and brutal weapons.⁸

Since antiquity it has been recognized that conventions of war are culturally and historically determined. In the first century BC, the geographer Strabo remarked, “Among all the customs of warfare and of usage of arms there neither is, nor has been, any single custom.” The Greek historian Thucydides

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(fifth century BC) stressed that ideal standards of behavior in war were in constant conflict with expediency, ingenuity, and passion. In classical antiquity, a single day's battle between equally armed warriors was often decisive, and biological weapons may have been less of a temptation. Yet biological and chemical weapons were known from earliest times, and with the development of siege craft and long-drawn-out wars, unfair and secret weapons became ever more attractive. In sieges, civil wars, and rebellions, or in conflicts with exotic cultures, the whole population was considered the enemy, further lifting constraints on vicious weaponry and total-war tactics.⁹

“As fighting became more destructive,” notes historian Peter Krentz, “a new, nostalgic ideology of war developed.” Krentz was speaking of Greece after the savage Peloponnesian War (431–404 BC), but his words could also apply to modern historians who imagine that wars were somehow more humane and fairer in antiquity owing to “ancient taboos” or formal rules against toxic and incendiary weapons. As historian Josiah Ober remarks, however, “Any argument which assumes that a universal sense of fair play and decency was an innate part of early Greek military culture is easily falsified.” The tension between the “fair fight” and “winning by whatever means necessary” was evident from the very beginning.¹⁰

In classical Greek combat—hand-to-hand fighting by hoplites (infantrymen armed with helmets, shields, and spears)—the mayhem of ordinary fighting with regular hacking and stabbing weapons was extreme (fig. 1). The Roman historian Sallust painted a vivid picture of the aftermath of a typical, decisive battle between Roman cavalry troops and Numidian and Moorish elephant and cavalry divisions in 106 BC. “The end of it was that the enemy were everywhere defeated.

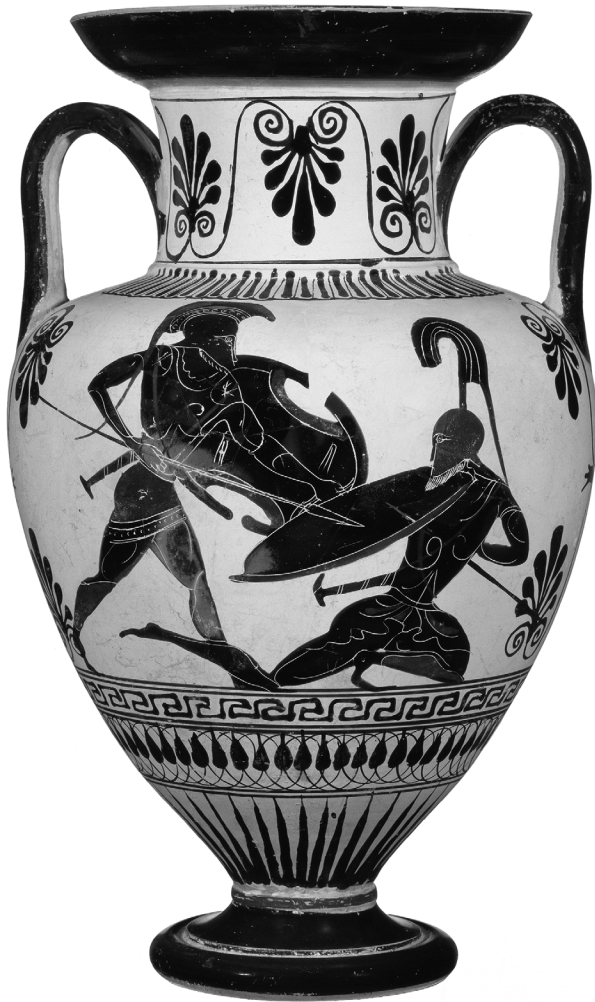


FIG. 1. Heroic hoplite combat, face-to-face fighting between equally matched Greek warriors using conventional weapons of spear and shield. Attic black-figure neck amphora, 500–480 BC, 86.AE.78. Courtesy of the J. Paul Getty Museum Open Content Program.

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The broad plain presented a ghastly spectacle of flight and pursuit, slaughter and capture. Horses and men were thrown down; many of the wounded, without the strength to escape or patience to lie still, struggled to get up only to collapse immediately. As far as the eye could reach, the battlefield was strewn with weapons, armor, and corpses, with patches of bloodstained earth showing between them.”¹¹

As dreadful as such carnage was, though, it was exactly what men and their commanders expected and prepared for. A well-armed and armored soldier trained for the fighting, steeled himself for the battle and the possibility of death, advanced into the fray, and fought the enemy face-to-face to the end. The glory and nobility of battle depended on the concept of “reciprocal risk.”¹² Courage in the face of death and strong combat skills counted for something: a soldier could win or die honorably—and these were crucial values for ancient warrior cultures.

But clever ruses were also highly respected in warrior cultures. Odysseus, the archer-hero of Homer’s *Odyssey* and *Iliad*, was a master of deception. A complex figure who practiced both acceptable and heinous ruses, Odysseus’s most celebrated trick was the Trojan Horse. It was a tempting gift that the Trojans could have rejected. Odysseus played on their pride and greed, not their biological vulnerability; therefore the ploy seems fair. But Odysseus also poisoned his arrows, and Homer makes it clear that toxic projectiles were dishonorable. Archers were admired for their marksmanship, but they were never models of bravery, since they shot missiles from afar, avoiding direct confrontation.¹³

If long-distance weapons in themselves were regarded with ambivalence by classical Greeks and Romans, then treating

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long-distance projectiles with poison could elicit even more disapproval. Use of a poison arrow meant that even a poor marksman could inflict grievous suffering and death on the mightiest warrior, because even a slight nick sent lethal toxins into his bloodstream. In cultures that valued intelligent cunning as well as physical courage in battle situations, conflicting ideas arose over which weapons and strategies were acceptable and which were questionable. Were crafty methods—what some would call underhanded, cowardly ruses—ever justified? The traditional view held that underhanded tricks and treachery should be shameful to any true warrior. Like arrows and ambush, biochemical weapons also allowed one to surprise and destroy enemies from a position of safety, without risking battle. As the toxic equivalents of arrows and ambush, therefore, poison weapons could elicit criticism, yet they were certainly not always shunned. Drawing the line between creative resourcefulness and reprehensible tactics has always proved difficult in practice.¹⁴



What do ancient rules of war have to say about insidious weapons? For the most part one must extrapolate ideas about bio-war from military practices described in ancient accounts. Very little is known about Persian and Carthaginian rules of war, for example, and we must rely on Greek and Latin historians for descriptions of war among the Gauls/Celts, Africans, and Scythians of Central Asia. These peoples used poison projectiles, but they were also the victims of biological subterfuges by the Romans and Persians. Disapproval of the use of either poisons or chemicals can be found in ancient

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Indian, Greek, Roman, Chinese, and Muslim traditions, but inconsistencies and contradictions cloud the issue of what was deemed acceptable in warfare.¹⁵

In ancient India, as in Greece, two kinds of warfare were recognized. There was righteous war carried out according to ethical principles with the approval of society, and there was crafty, ruthless war pursued in secret, without regard for moral standards. The tensions between these two approaches are embodied in two famous military codes of ancient India. The *Laws of Manu* are Hindu rules of conduct for Brahman rulers dating in oral form to about 500 BC, codified in Sanskrit in about AD 150. The *Laws* are commonly cited as the oldest prohibitions against biochemical warfare, because they forbade the use of arrows tipped with poison or fire. Reading further, though, one finds the *Laws* advising kings to “continually spoil the grass and water” of a besieged enemy.¹⁶

The *Arthashastra* represented the more unambiguously nefarious side of ancient Indian warfare. This military treatise, attributed to the Brahman adviser to King Chandragupta in the fourth century BC, is filled with instructions for waging war with secret weapons, and it urged kings to deploy poisons without qualms. The *Arthashastra*'s compilation of hundreds of recipes for toxic weapons and the unscrupulous tactics it describes foreshadow the sentiment attributed to the notorious Dr. Shiro Ishii, director of Japan's bioweapons program in World War II: if a weapon is important enough to be prohibited, it must be worth having in one's arsenal. Yet even the ruthless *Arthashastra* also advised kings to win over enemy hearts with their “own excellent qualities,” and exhorted victors to spare the wounded and vanquished. Another example of dramatically opposite advice in the two Indian treatises

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applies to calmatives. The *Laws of Manu* forbade attacks on sleeping enemies, whereas the *Arthashastra* recommended intoxicants and soporifics, for the best time to attack is when foes are overcome by sleep.¹⁷

Contradictions can be found among rules of war and military manuals in China too. *The Art of War* by Sun Tzu (about 500 BC), for example, stressed *kueitao*, deceptive means, and advocated the use of fire as a terror weapon, and other Chinese treatises described myriad recipes for toxic smokes and poison incendiaries. Humanitarian codes of war of about 450–200 BC, however, forbade ruses of war, harming non-combatants, and causing unnecessary suffering.¹⁸

In the ancient Near East, the book of Deuteronomy (written between the seventh and fifth centuries BC) sets forth Yahweh's rules of war for the Israelites. The instructions include the famous law of retaliation "without pity," namely, "life for life, eye for eye, tooth for tooth, hand for hand." When God's chosen people besieged cities outside the promised land that "refused to become enslaved," the Jews were to kill all males and claim women and children as booty. Cities within Palestine were to be treated mercilessly, however: "You shall utterly destroy them, leaving nothing alive that breathes." Only orchards were to be spared. These rules were put into practice, for example, in the total destruction of Jericho in about 1350 BC. Biological weapons would not appear to be prohibited under these harsh "holy war" principles, and, notably, Exodus recounts some of the earliest intentions to carry out biological warfare, in the plagues called down on Egypt—although the motive in that case was resistance, not aggression.¹⁹

Some modern histories of biological and chemical warfare assert that the Quran (written in the seventh century AD)

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forbids the use of poison and fire as weapons of war. But the Quranic injunctions that might apply to biochemical strategies are vague: “Do not make mischief on the earth,” “Show restraint,” and “Do not transgress limits.” These may have presupposed an unwritten “warrior code of honor known to its first hearers” now lost, suggests John Kelsay, a scholar of Islamic rules of war. There is literary evidence that pre-Islamic Persian and Arab Sasanians took pride in “purity” of warfare. In the ninth to twelfth centuries, a concept of youthful brotherhood, *futuwwa*, evolved from Persian and Arab traditions of honorable, noble, and proper conduct in battle into a code of honor or bond among warrior groups, which became known as “Islamic chivalry.” *Futuwwa* ideals influenced European medieval notions of chivalry, such as courage, generosity, loyalty, fair combat, no night attacks, no attacks from the rear if the enemy is fleeing, no flammable weapons, and so on. In the seventh century, in a famous decree, Abu Bakr al-Siddiq (the first caliph after the death of his companion Muhammad in AD 632), gave his military commander a set of “rules for guidance on the battlefield: Do not commit treachery or deviate from the right path. You must not mutilate dead bodies; do not kill a woman, a child, or an aged man; do not cut down fruitful trees; do not destroy inhabited areas; do not slaughter any of the enemies’ sheep, cows, or camels except for food; do not burn date palms, nor inundate them. . . . You are likely to pass by people who have devoted their lives to monastic services; leave them alone.”²⁰

Some rules have been inferred from later Islamic traditions, based on the deeds and sayings of Muhammad compiled after his death (in AD 632). In the opinion of modern Muslim scholar Hamza Yusuf, Muhammad “clearly prohibited

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killing noncombatants, women and children [and] poisoning wells, which I think can be applied to biological warfare.” Muhammad also “prohibited using fire as a means to kill another being,” because fire belonged to Allah. But the Quran prescribed punishment by fire for disbelievers: “For them are cut out garments of fire, boiling water shall be poured over their heads,” and their skin and body “shall be melted.” As many historians have pointed out, classical Islamic scholars differed over permissible weapons and tactics, depending on whether adversaries were Muslims or non-Muslims.²¹

Denying drinking water, even to enemies, was a grievous wrong in early Islamic belief. (In contrast, ancient Roman commanders had no qualms about achieving victories “by thirst.”) In the civil wars after Muhammad’s death, however, that rule was violated by the dominant Umayyad forces, who were censured for transgressions of Islamic ideals.²²

Some classical Islamic jurists maintained that flooding, flamethrowers, and mangonels (to catapult burning naphtha; see chapter 7) were not to be used except for “dire necessity or self-defence.” For some Muslim jurists, fire weapons were deemed especially brutal and therefore unacceptable. Yet fire weapons were used routinely by early Islamic armies, even against other Muslims. Muhammad lived at a time when petrochemical incendiaries were common in siege craft. During the siege of Mecca in AD 683, Muslim forces catapulted burning petroleum at the rival Muslim defenders. By AD 900, Islamic armies maintained special *naffatun* troops to wield devastating “liquid fire,” which became a favorite weapon against the Crusaders. Perhaps because of bans on poisoning water or air, however, Muslims apparently refrained from adding toxins to

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their incendiaries, which were common in ancient Chinese and Indian recipes.²³

No formal set of rules of war existed in Greece. The military historian Polybius (born 204 BC) stated that the “ancients” preferred open, hand-to-hand battle to deception and ruses, and followed a “convention among themselves” not to use “secret missiles or those discharged from a distance.” But only two instances of sworn agreements prohibiting certain types of weapons are known in Greece. One, recounted by Strabo, was inscribed on a column in a temple in Euboea and recorded that in the Lelantine War (about 700 BC) the contending parties had agreed to ban projectile weapons. The other agreement directly applies to biological warfare. In the sixth century BC, after a Greek city, Kirrha, was destroyed by poison during an attack by an alliance of city-states, the alliance promised to refrain from such acts against fellow Greeks.²⁴

A dozen informal rules of war were gleaned from ancient Greek literature by historian Josiah Ober. They concern declarations of war and truces; prohibit the killing of messengers, noncombatants, and captives; and express a distaste for projectile weapons. As Ober notes, these rules “were certainly not always honored in practice,” and during the Peloponnesian War the “informal Greek rules of war broke down.”²⁵

The main sources for warfare practices are found in histories written in antiquity, but even then the writers rarely considered the rules of war unless some exceptional event occurred. It was only in describing unusual biological strategies that authors sometimes indicated the generally held standards of conduct in war. Herodotus, for example, the Greek historian writing in about 450 BC, described the moral outrage

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of Queen Tomyris of the Massagetae, when the Persians set out wine to drug her unsuspecting troops and then slaughtered them. There is no soldierly honor in your victory, she declared, only shame (chapter 5).

During the Peloponnesian War, which brought accusations of well poisoning and inventions of new chemical weapons, Thucydides wrote approvingly of one hoplite battle of 433 BC that was an increasingly rare instance in which “courage and sheer strength played a greater part than scientific methods.” The brutality of the Peloponnesian War undermined the “general laws of humanity,” despaired Thucydides. “Victory won by treachery” was now equated with “superior intelligence,” and “most people are ready to call villainy cleverness.” Profound disapproval suffuses his descriptions of atrocities against noncombatants.²⁶

After the Peloponnesian War, Aeneas the Tactician wrote a manual on how to survive sieges. He advised defenders to poison water supplies, to throw burning materials onto attackers, and to choke them with noxious smoke. Significantly, all these biochemical tactics were intended for the *defense* of besieged cities. In antiquity, as today, biochemical weapons often seem more acceptable when used against aggressors.²⁷

Roman notions of just war were articulated by the philosopher Cicero (106–43 BC), who believed that obeying rules of war and refraining from cruelty were what set men apart from beasts. But his laws concerned the legitimate grounds for going to war, rather than its conduct. Reactions to biological strategies are found in other Roman writers’ remarks. The historian Florus, for example, castigated a Roman general for poisoning wells in Asia, and thereby sullyng Roman honor; the poet Ovid deplored toxic arrows, and Silius Italicus de-

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clared that poisons brought “disgrace” to iron weapons. The historian Tacitus (AD 98) voiced grudging admiration for a German tribe who intensified “their savage instincts by trickery and clever” means, rather than opting for poison arrows like the Gauls and other groups. The Germans blackened their shields, dyed their bodies black, and “chose pitch dark nights for their battle,” wrote Tacitus. “The appearance of such a ghoulish army inspires mortal panic, for no enemy can endure a sight so strange and hellish.” This ancient example of creative psychological warfare was considered fair, whereas poisoning, Tacitus makes clear elsewhere, violated the old Roman tradition of open battle.²⁸

In contrast, by the second century AD, the Roman strategist Polyænus wrote a military treatise for emperors that openly advocated biochemical and devious stratagems for defeating “barbarians” without risking battle. As the empire was increasingly forced to desperately defend all its borders, the old ideals of forthright combat and leniency were replaced by policies of maximum force and treachery. The new policies were articulated by the Roman military strategist Vegetius, writing in AD 390: “It is preferable to subdue an enemy by famine, raids, and terror, than in battle where fortune tends to have more influence than bravery.”²⁹

Despite a general sense in antiquity that biological weapons were cruel and dishonorable, the evidence shows that they were employed in certain situations. So when might the rules of war be overridden?

Self-defense, mentioned earlier, was a time-honored rationale. Besieged cities resorted to all manner of resistance, including biochemical options, and desperate populations overcome by invaders turned to bioweapons as a last resort.

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When one's forces were outnumbered or facing troops superior in courage, skill, or technology, biological and chemical strategies were a real advantage, as force multipliers. Indeed, the perils and loss of lives in a fair fight could be avoided altogether through the deployment of toxic weapons, an approach that appealed to Polyaeus and other Romans who admired the Greek mythic hero Odysseus as the model strategist.

When opponents are identified as “barbarians” or cultural outsiders, their alleged “uncivilized nature” has long served as an excuse for using unscrupulous weapons and inhumane tactics against them. Other situations, such as holy wars or quelling rebellions, also encouraged the indiscriminate use of bioweapons, targeting noncombatants as well as warriors. Some commanders used poison in frustration when losing a war, or to break a stalemate or a long-drawn-out siege. The threat of horrifying weapons might discourage would-be attackers or could be used by aggressors to bring about quick capitulation. Then there were those ruthless generals who had no compunctions about using any strategy or weapon at hand to win victory. And in many of the cultures encountered by the Greeks and Romans, poison arrows and ambush were the customary way of war.³⁰



Although it is tempting to imagine an ancient era innocent of biochemical weaponry, in fact this Pandora's box of horrors was opened thousands of years ago. The history of making war with biological weapons begins in mythology, in ancient oral traditions that preserved records of actual events and ideas of

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the era before the invention of written histories. The evidence from ancient myth shatters the notion of a time when biowar was inconceivable; it also suggests that profound doubts about the propriety of such weapons arose along with their earliest usage.

After considering the mythic invention of poison weapons and their use in the legendary Trojan War in chapter 1, we turn to the actual practices of biological and chemical warfare in historical times. Ancient authors reveal exactly how arrow poisons were concocted from venoms and toxins, and who used them in the ancient world (chapter 2), and they describe the first documented cases of poisoning enemies' water supplies and maneuvering foes into deadly environments (chapter 3). Chapter 4 presents compelling evidence from Near Eastern, Greek and Latin, and Indian sources suggesting how plagues and other infectious diseases may have been deliberately spread. Toxic honey, tainted wine, and other attractive lures have long served as secret weapons, as chapter 5 reveals. Chapter 6 tells how venomous creatures and large and small animals have been drafted for war duty. Chemical incendiaries have a surprisingly ancient history too: chapter 7 begins with the earliest uses of poison gases and ancient versions of napalm before turning to the invention of Greek Fire in the seventh century AD.

The difficulty of controlling the forces unleashed when nature itself is turned into a weapon means that the annals of biochemical warfare are rife with risks of self-injury, friends fired upon in error, collateral damage, and unforeseen consequences, even for future generations, as noted in the afterword. Because unconventional weapons are intended to

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destabilize and play on the unexpected, such strategies by their very nature have cut an “erratic course” through history. It is only logical, therefore, that those who use biochemical weapons should reap a “whirlwind of unintended results.”³¹ The resort to secret weapons capable of mass destruction is a double-edged sword—a theme that first emerged in ancient myth and pervades the long history of biochemical weapons.

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